

# Metaphors in the Mix

Rodney BERRY, Makoto TADENUMA, Mao MAKINO, Naoto HIKAWA

ATR Media Information Science Laboratories, Kyoto, Japan

rodney@atr.co.jp, tadenuma@atr.co.jp, mao@atr.co.jp, hikawa@atr.co.jp

## Abstract

*Augmented Reality represents a collision of universes, between that of physical experience and the universe of symbols and meaning. Our passage back and forth between realities long predates our use of computers, and our attempts to separate the real from the virtual. Mixed and augmented reality offers the media artist rich territories for exploration wherever meaning migrates between the experiential and the symbolic. The authors' works in progress investigate both the practical application of mixed reality as an educational tool, and the aesthetic potential of the technology itself.*

## 1. Introduction

Augmented reality provides a place that sits somewhere between the physical world of everyday experience and the virtual world of the computer. The technologies involved in augmented reality vary a great deal in sophistication and expense, but they all use elements and landmarks in the real world as pointers to elements in the virtual world and vice-versa. For example, I might focus my attention on a particular building in the real world, and also be presented with information about its functions, floor plans etc. in my visual display goggles. Conversely, objects in the virtual space may direct me to other buildings in the real world and provide maps of how to get there.

## 2. Real and Virtual

Defining the real and the virtual as being exclusive of each other, places limits on the ways we might conceive of and use augmented reality. Augmented reality is, after all, as much an attitude to technology as it is a technology itself. Unlike immersive virtual reality, augmented reality applications typically do not seek to immerse the participant in a completely different world. Rather, they seek to illuminate aspects of the real world with extra information from the virtual world. Mixed reality is another term used interchangeably with augmented reality. More strictly applied, mixed reality might imply a more balanced relationship between the real and the virtual, however, for the purpose of this writing, the two terms will mean much the same thing. In a mixed reality environment, an object can often have both real and virtual components. The real part is often the part that we can actually locate and manipulate in the physical world. This physical object usually also incorporates some means by which the computer can also locate it and attach its computer-generated or virtual components. In this way, the virtual part of the object borrows credibility from the weight and tangibility of the real part of the object.

It is also a mistake to assume that the 'virtual' must always take place inside the computer. We have dealt with abstract spaces and representations as tools for dealing with the world for a lot longer than we have had computers. The ability to mentally model situations in order to understand or make predictions is a basic human quality. In a sense, we often inhabit our simulated versions of the real world a lot more than we care to imagine (we even construct imaginary versions of other people and have lengthy conversations with them in their absence). A large portion of our waking and dreaming life is spent interacting with 'virtual' environments and characters without even turning on a computer. From the moment we began to use symbols and representations, we became enmeshed in the virtual. Conversely, physical objects frequently function as symbols or as anchors for our thoughts. In my garden here in Japan, my wife recently planted an Australian eucalypt tree that she bought for my birthday. When I look at this tree, I am amazed by the layers of meaning and significance that I readily attach to it. In this sense, the real world is never completely real. Objects in the real world quickly become objects of meaning.

## 3. Other Aesthetic Implications

Through our technologies we see and hear things that are removed in space and time. We are aware that a degree of deterioration and filtering of the information must be taking place. However, so-called Machine vision technologies not only transmit visual information but also actively interpret this information on our behalf. What we receive is a re-interpreted version of reality made real by our trust in the mechanisms of mediation. In the case of camera-based augmented reality systems such as the ones we are using, the viewer and the computer both see and interpret what is in their shared field of vision. The viewer must then interpret the computer's interpretation of the scene in order to construct his or her internal picture of what is real or meaningful. This means that the human and the computer may cooperatively negotiate a shared view of reality.

## 4. Music and Mixed Reality

In music, a variety of abstract representations are used to conceive of and manipulate musical structure. At ATR Media Information Science Laboratories, we are engaged in several projects that explore ways of representing music as an interactive space. The primary objective is to provide a way of playing within the abstract space of the music allowing an intuitive understanding to inform the learning and creation of music. In developing and refining these systems, I also hope to pave the way for several new media artworks that deal with what I see as a

collision of universes, between the experiential world and the world of symbols.

The particular form of mixed reality technology we are working with is what is known as a *camera see-through* system. Our systems are based on the Augmented Reality Toolkit a set of programming libraries developed by Hirokazu Kato of Hiroshima University and maintained by a number of people associated with the Human Interface Technology Laboratory at University of Washington[1]. A camera is mounted on a set of video glasses. This allows the user to see whatever is normally blocked out by the act of wearing the glasses. This comically redundant arrangement actually enables the blending of realities to take place. The computer is trained to recognize certain marker patterns together with their position, distance and orientation in relation to the camera. This information allows the computer to superimpose a computer-generated 3D image at the precise location of the marker. When the marker is moved, the computer can accurately track it and reposition the 3D model. If you hold a marked card on your hand, you can see a dancing pixie (or whatever the computer has placed there) and turn it around to see the other side etc., as long as the marker pattern is still visible to the computer.

## 5. The Augmented Composer

The Augmented Composer[2] is a system that allows a user to create and manipulate musical phrases by arranging a set of marked cards on a tabletop. The placement of cards from left to right determines the order in which the notes are played while their location toward and away from the user governs which actual note is to be played. Various modifier cards can be used to change the accent and duration of each note and to save the completed phrase onto a special phrase card. The phrase cards can then be combined to make larger musical structures. The notes themselves are represented graphically as animated toy snakes that get longer and shorter depending on the length of the notes. The system is intended as a place where real musical objects can be moved around and where musical structure can be experienced as a physical space.



Figure 1. The Augmented Composer

## 6. The Book of Mirrors

In parallel to the more education-oriented projects, we are also developing a series of artworks intended to explore the

significance and potentials of augmented reality. "The Book of Mirrors" is an imaginary book concerning people's use of symbols and representation. It comes from the time of China's yellow emperor who, through powerful magic, ended a war between our world and the world beyond the mirror. The mirrors were frozen solid so nobody could pass through, and the mirror people were robbed of their forms and forced to copy our appearance and movement. We now live in the time, foretold by the yellow emperor, when the magic loses its power, and the mirror world begins to free itself from its prison. The narrative unfolds as the visitor manipulates a set of large markers in front of a large display screen. Different episodes and versions of the work may involve head-mounted displays as well. The figure shows a scene from "The Elements", a kind of alchemical primer and prelude to "The Book of Mirrors". The five elements are arranged and combined to make elemental beasts and control a shifting sound-scape.



Figure 2. "The Elements" from "The Book of Mirrors"

## 7. Conclusions

Augmented and mixed realities provide a fertile ground for artistic exploration. The potential for migration of meaning between the world of experience and the world of symbols and representation opens up a wealth of avenues for the artist. In my own work I plan to divide my efforts between the development of a functional creative tool for young people, and a more large-scale, open-ended work dealing with the issues raised by the technology itself. Later episodes of "The Book of Mirrors" will focus on tensions between the participant's and the computer's interpretation of the visual symbols.

*The research reported here was supported in part by a contract with the Telecommunication Advancement Organization of Japan entitled, "A Study of Innovational Interaction Media toward a Coming High Functioned Network Society".*

## Reference

- [1] H. Kato and M. Billinghurst. "Marker Tracking and HMD Calibration for a Video-based Augmented Reality Conferencing System", Proc. of 2nd Int. Workshop on Augmented Reality, pp.85-94 (1999).
- [2] R. Berry, M. Tadenuma,, "The Augmented Composer", Proceedings of NICOGRAPH 2002, Nicograph, Tokyo, 2002, pp:127-131.